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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/565,289	01/20/2006	Ingmar Graesslin	PHUS030240US	9607

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PHILIPS INTELLECTUAL PROPERTY & STANDARDS
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EXAMINER	
FERNANDEZ, KATHERINE L	

ART UNIT	PAPER NUMBER
3768	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/565,289	GRAESSLIN ET AL.	
	Examiner	Art Unit	
	Katherine L. Fernandez	3768	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 January 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *20 January 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *1/20/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Priority

1. Applicant's claim for the benefit of a prior-filed application under 35 U.S.C. 119(e) or under 35 U.S.C. 120, 121, or 365(c) is acknowledged.

Information Disclosure Statement

2. The Information Disclosure Statement filed on January 20, 2006 is acknowledged. The Information Disclosure Statement meets the requirements of 37 C.F.R. 1.97 and 1.98 and therefore the references therein have been considered.

Claim Objections

3. Claims 20-21 are objected to because of the following informalities:

With regards to claim 20, in lines 3-5 and 7, it is suggested that the element references (i.e. 54_m, $42_{n/2}$, 42_n) be deleted in order to maintain consistency with the rest of the disclosed claims.

With regards to claim 21, in lines 4, 6, 9 and 11, it is suggested that the element references (i.e. 54_1,54_2, 54_m) be deleted in order to maintain consistency with the rest of the disclosed claims.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-3, 5-17 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sodickson (US. Pub. No. 2002/0158632) in view of Rupp (US Patent No. 5,784,636).

Sodickson discloses an MRI system (10) and method comprising: a means (12, transmit RF coils) for creating and transmitting RF pulses into an examination region to excite and manipulate a spin system to be imaged; a means (20a, 20b...20i; surface coils) for picking up an MR signal emitted from the examination region; a means (pg. 1, paragraph [0005], referring to signal processing and digitizing channels) for demodulating the MR signal and converting the demodulated MR signal into digital data; and a means (18; pg. 1, paragraph [0004]) for reconstructing images from the digital data, which includes: a plurality of processing units (i.e. personal computers and workstations)(pg. 2, paragraph [0019]; pg. 3, paragraph [0022]; pg. 6, paragraph [0078] and [0085], referring to MRI software running on a group of computers to enable parallel image reconstruction and the computer system can be a multiprocessor system or include multiple computers connected over a computer network). As can be seen from Figure 24, the plurality of processing units may include embedded processors (pg. 6, paragraph [0085]). As discussed above, Sodickson discloses that the computer may be configured to create parallel image reconstructions, and surface coils are used to acquire NMR signals for simultaneous signal reception, along with corresponding signal processing and digitizing channels (i.e. independent parallel processing channels) (pg. 1, paragraph [0005]; pg. 6, paragraph [0078]).

The means (20a,20b...20i) for picking up the MR signal includes a plurality of coil elements (pg. 1, paragraph [0005]) and the means for demodulating and converting the MR signal includes a plurality of RF receivers each operatively connected to an associated coil element, (pg. 1, paragraph [0005], referring to simultaneous signal reception, along with corresponding signal processing and digitizing channels) and further including: a means for interconnecting the processing units to arrange the processing units into a plurality of independent parallel processing channels and each channel being operatively connected with one or more RF receivers (pg. 2, paragraph [0016], [0019]; See Figures 3a-3e; pg. 3, paragraph [0022]; Figures 4a-4c).

Further, the image reconstruction method SMASH, consists of performing the following steps which can be executed in a pipeline manner: 1) first pipeline stage to operate on the digital data in k-space (pg. 3, paragraph [0022], Figure 4, left hand side); 2) intermediate pipeline stages to transform the digital data from k-space to an image domain (pg. 3, paragraph [0022]; Figure 4A,B, right side); and 3) a final pipeline stage to operate on the digital data in the image domain (pg. 3, paragraph [0022]; Figure 4C, right side). Thus, an exchange of data generated by the independent processing channels is restricted to an image domain (pg. 3, paragraph [0022]; Figure 4C, right side) which is allocated to the final pipeline stage via the combining unit discussed below. The computer and MRI software (24) act as a combining unit operatively connected to the processing units allocated to a final pipeline stage to manipulate outputs of each channel (pg. 6, paragraph [0078], [0085]; pg. 7, paragraph [0087], [0093]; See Figure 24). The combining unit weights the output of each channel and

sums the weighted outputs (pg. 8, paragraphs [0101]-[0104]). As depicted in Figure 4, the SMASH reconstruction method involves combining an image from a first channel with an image from an adjacent channel to form a first intermediate combined image, and combining an image from a channel with an image from an adjacent channel to form a second intermediate combined image; and combining each intermediate combined image with an image from another channel to generate new intermediate combined images until images from all channels have been combined into a resultant combined image (pg. 3, paragraph [0022]).

However, they do not specifically disclose that the plurality of processing units include dynamically reconfigurable connections. Rupp et al. disclose architecture for information processing devices which allows the construction of low cost, high performance systems for specialized computing applications involving sensor data processing (column 3, lines 36-39). They disclose that their invention uses a reconfigurable computer architecture that includes a Reconfigurable Signal Processor based on a computing architecture for data processing which integrates configurable logic and parallel processing interconnect structures (column 6, lines 4-13). Their reconfigurable signal processor utilizes a Pipelined Bus Array to simplify the process (column 6, lines 34-37). At the time of the invention, it would have been obvious to one of ordinary skill in the art to include dynamically reconfigurable connections in the system of Sodickson. The motivation for doing so would have been to achieve very high levels of performance, as taught by Rupp (column 1, lines 14-28).

6. Claims 4,18 and 20-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sodickson in view of Rupp as applied to claims 1, 3, and 5 above, and further in view of Farwell et al. (US Patent No. 6,920,545).

With regards to claim 4, as discussed above, the combined references of Sodickson in view of Rupp meet the limitations of claim 1. However, they do not specifically disclose that the processing units are dynamically configured utilizing a switched fabric, a crossbar or the like. Farwell et al disclose a reconfigurable computer architecture (column 1, lines 9-11). They disclose the use of a crossbar switch, to which outputs of every element in a cluster connect (column 1, lines 65-67). At the time of the invention, it would have been obvious to one of ordinary skill in the art to have included a crossbar switch to the system of Sodickson in view of Rupp. The motivation for doing so would have been to provide unrestricted configurability of connections between elements, as taught by Farwell et al. (column 1, line 67 through column 2, line 4).

With regards to claims 18 and 20-22, the combined references of Sodickson and Rupp meet the limitations of claims 11,14,15,16,17 and 19 as discussed above. Sodickson further discloses that each module or step in their method can correspond to separate modules of a computer program, or may be separate computer programs and such modules may be performed on separate computers and that the computer may be configured to create parallel image reconstructions, and surface coils are used to acquire NMR signals for simultaneous signal reception, along with corresponding signal processing and digitizing channels (i.e. two separate independent parallel processing channels can be utilized for processing the reconstruction algorithm) (pg. 1, paragraph

[0005]; pg. 6, paragraph [0078], [0085]). However, they do not specifically disclose that their method further includes distributing the resultant combined image to the processing units allocated to the final pipeline stage by consecutively forwarding the resultant combined image from the middle channel in direction of the last channel and simultaneously forwarding the resultant combined image in opposite directions from the middle channel in direction of the last channel via adjacent processing units. They also do not disclose that their method further includes the step of mapping a forward processing of iterative reconstruction algorithms to the pipeline stages; mapping a backward processing of the iterative reconstruction algorithms to the pipeline stages; and simultaneously performing the forward and backward processing of different data sets, such that: a first pipeline stage operates on the digital data in k-space and a final pipeline stage operates on the digital data in an image domain. Farwell et al. disclose a reconfigurable processor architecture which comprises of interconnections between the processing elements that data links to nearest neighbor elements, with options of send, receive, or pass-through (i.e. method can include distributing data to processing units by consecutively forwarding the data from a middle channel and simultaneously forwarding the data in opposite directions from the middle channel in direction of the last channel via adjacent processing units; method can include forward and backward processing of data) (column 3, lines 24-46, See Figures 2,3 and 5). At the time of the invention, it would have been obvious to one of ordinary skill in the art to include the above listed steps in the method of Sodickson and Rupp. The motivation for doing so would have

been to provide a fast and efficient way to distribute and process data, as taught by Farwell et al. (column 3, lines 56-65).

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Katherine L. Fernandez whose telephone number is (571)272-1957. The examiner can normally be reached on 8:30-5, Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eleni M. Mantis-Mercader can be reached on (571)272-4740. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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